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CHAPTER 5

ACOUSTIC SPACE IS AFFECTED BY ANTHROPOGENIC HABITAT FEATURES: IMPLICATIONS FOR AVIAN VOCAL COMMUNICATION

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Abstract.—Human-altered landscapes often include structural features, such as higher levels of impervious surface cover (ISC) and less vegetation, that are likely to affect the transmission of avian vocalizations. We investigated the relationships between human habitat modifications and signal transmission by measuring four acoustic parameters—persistence, reverberation, and signal-to-noise ratio (SNR) of broadcast tones, as well as absolute ambient noise level—in each of 39 avian breeding territories across an anthropogenic disturbance gradient. Using a geographic information system, we quantified the amounts of different habitat features (e.g., ISC, grass, trees) at each site; a principal component analysis was used to identify which of these habitat features commonly co-occurred (e.g., "habitat suites"). Finally, we used a model selection process to explore whether the habitat suites predicted the acoustic parameters. Tone persistence was higher and reverberation was lower in more open, grassy habitats than in areas with more vertical anthropogenic structures. In more human-modified sites, ambient noise levels were higher, leading to lower SNR. In habitats with low levels of human modification, we found that even small increases in the total amount of open–grassy area will quickly improve the acoustic space of singing birds. However, our results also indicated that there may be a critical level of human habitat modification above which the addition of "natural" areas does not benefit avian communication. Thus, we recommend that managers focus their efforts on preserving pre-existing "natural" habitat, rather than attempting to introduce it into areas that have already received significant human modification.

Key words: bird song, disturbance, impervious surface, secondary cavity nester, sound propagation.

El Espacio Acústico es Afectado por Características Antropogénicas del Hábitat: Implicaciones para la Comunicación de Aves Locales

Resumen.—Generalmente, los paisajes afectados por el ser humano incluyen características estructurales, como altos niveles de cobertura de superficies impenetrables (CSI) y menor vegetación, que probablemente pueden afectar la transmisión de las vocalizaciones de las aves. Investigamos la relación entre las modificaciones humanas del hábitat y la transmisión de las señales midiendo cuatro parámetros acústicos –persistencia, reverberación, y el cociente señal-ruido (CSR) de tonos transmitidos, así como el nivel absoluto de ruido ambiental– en cada uno de 39 territorios reproductivos de aves a lo largo de un gradiente de disturbio antropogénico. Mediante sistemas de información geográfica, cuantificamos las cantidades de diferentes atributos del hábitat (e.g., CSI, pastos, árboles) en cada sitio. Hicimos un análisis de componentes

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